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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|--|-------------|----------------------|----------------------|------------------|
| 10/766,465 | 01/27/2004 | Ling Ma | IR-2444 CIP (2-3869) | 3194 |
| 2352 | 7590 | 04/22/2008 | EXAMINER | |
| OSTROLENK FABER GERB & SOFFEN 1180 AVENUE OF THE AMERICAS NEW YORK, NY 100368403 | | | | KIM, SU C |
| ART UNIT | | PAPER NUMBER | | |
| 2823 | | | | |
| MAIL DATE | | DELIVERY MODE | | |
| 04/22/2008 | | PAPER | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|------------------------|---------------------|--|
| Office Action Summary | Application No. | Applicant(s) | |
| | 10/766,465 | MA ET AL. | |
| | Examiner | Art Unit | |
| | SU C. KIM | 2823 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 29 February 2008.
 2a) This action is **FINAL**. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1 and 4-10 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1 and 4-10 is/are rejected.
 7) Claim(s) _____ is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 28 February 2006 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ . |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date <u>2/29/2008</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/29/2008 has been entered.

Allowable Subject Matter

2. The indicated allowability of claims 1& 4-10 are withdrawn in view of the newly discovered reference(s) to JP2000-101074. Rejections based on the newly cited reference(s) follow.

Claim Rejections - 35 USC § 112

3. Claims 1 & 7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "low temperature" in claim 1 (line 21 &23) is a relative term which renders the claim indefinite. The term "low temperature" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

In claim 7, reciting “said trench - - to achieve an optimum figure of merit” is confusing because optimum figure of merit is not defined in written disclosure and an ordinary skill in the art can not define an optimum figure of merit without specific demotion, thickness, size or range.

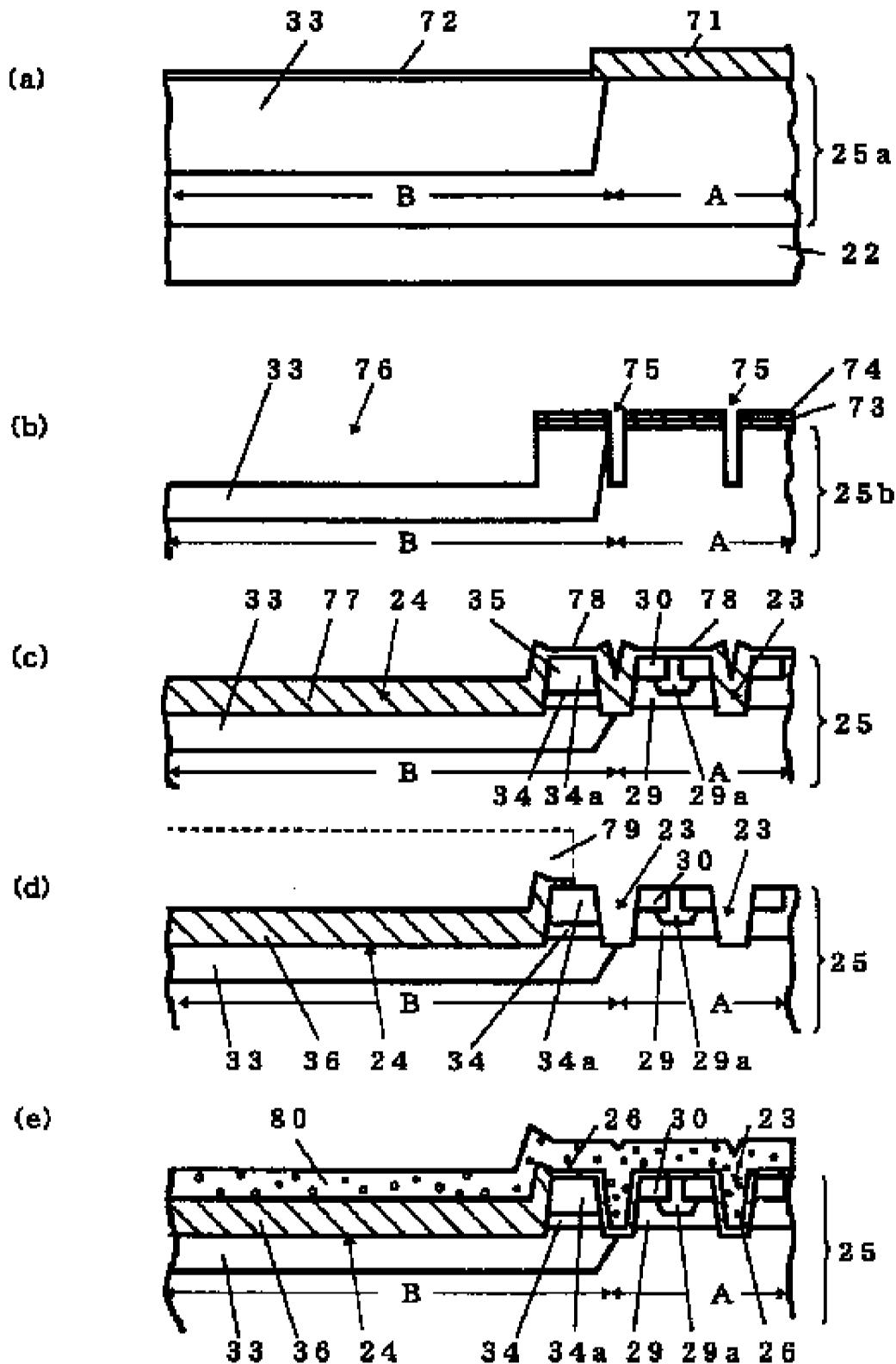
Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 & 7-9 are rejected under 35 U.S.C. 102(b) as being anticipated by Uno Hirohiko (JP2000-101074).



Regarding claim 1, Uno discloses a DC-DC converter comprising:

a synchronous semiconductor device; and

a control semiconductor device (Uno discloses a power mosfet);

wherein at least one of said semiconductor devices includes:

a semiconductor body of a first conductivity 28 which includes a channel region

29 of a second conductivity and a major surface (Drawing 4);

an active region 29 formed in said semiconductor body, said active region

including a plurality of spaced trenches each less than 0.5 microns wide (paragraph

0020, note: 0.2-0.7 micrometer) through said channel region 29 (Drawing 4);

a gate structure 27 disposed in each said trench, each gate structure including a gate oxide 26 layer disposed at least on sidewalls of a trench and a gate electrode 27 disposed adjacent said gate oxide 26 (Drawing 5);

conductive region 30 of said first conductivity formed in said channel region adjacent each said trench (Drawing 5);

highly doped contact regions 29a of said second conductivity formed in said channel region 29 (Drawing 5) each being laterally confined between two opposing conductive regions 30 & 29a (Drawing 5);

a metallic contact 32 (paragraph 0015, note: ohmic contact) in contact with said conductive regions 32 and said highly doped contact regions 29a; and

a termination structure, said termination structure including,

a termination trench 24 (Drawing 4) having a slanted sidewall formed in said semiconductor body, and a grown field oxide 36 formed in said termination trench below

said major surface, a polysilicon field plate 37 formed over said field oxide 36 (Drawing 4), where said field oxide layer 36 is thicker than said gate oxide layer 23, wherein said metallic contact 38 extends over said low temperature oxide body, and wherein said semiconductor body of said first conductivity extends from said trench to the bottom of said termination trench 28 (Drawing 4).

Regarding claim 7, as applied to claim 1, Uno discloses that the depth of said trench has been selected to achieve an optimum figure of merit (Uno, Drawing 4).

Regarding claim 8-9, as applied to claim 1, Uno discloses that said trench is stripe or cell (Uno Drawing 3).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uno Hirohiko (JP2000-101074) in view of Thapar (US 2001/0026989)

Regarding claim 4, as applied to claim 1, Uno discloses said trench includes an oxide mass formed at its bottom, said oxide mass and said gate oxide 23(Drawing 4).

Uno fails to teach said oxide mass is thicker than said gate oxide.

However, Thapar disclose that said oxide mass 61 is thicker than said gate oxide 20 (Fig. 5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Uno with said oxide mass is thicker than said gate oxide as taught by Thapar in order to improve a low gate to drain capacitance (paragraph 0003).

Regarding claim 5, as applied to claim 4, Uno and Thapar in combinations disclose that a semiconductor substrate 22 of said first conductivity, said semiconductor body 28 being formed over said semiconductor substrate 22, wherein said conductive regions are electrically connectable to said semiconductor substrate through invertible channels adjacent said trench (Uno, Drawing 4).

Regarding claim 6, as applied to claim 5, Uno and Thapar in combinations disclose that said conductive regions are source regions 30 (Uno, Drawing 4).

7. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uno Hirohiko (JP2000-101074) in view of Williams et al. (US 2002/0019099)

Regarding claim 10, as applied to claim 9, Unod disclose said trench is a cell (Drawing 3).

Uno fails to teach said cell is hexagonal.

However, William discloses a cell is hexagonal (Fig. 4D).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of applicant(s) claimed invention was made to provide Uno with a cell is hexagonal as taught by William in order to reduce channel resistance.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SU C. KIM whose telephone number is (571)272-5972. The examiner can normally be reached on Monday - Thursday, 9:00AM to 7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew S. Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Su C Kim/
Examiner, Art Unit 2823

/W. David Coleman/
Primary Examiner, Art Unit 2823

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